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(54) Frame structure for a printer.

(57) In a printer which comprises a mechanical unit having a platen, a carriage on which a print head is mounted, and other mechanical components, a controller board and a power unit connected via connectors to the respective mechanical components of the mechanical unit, and an upper cover covering these from above, a main frame comprising a mechanical component attachment section which has a horizontal bottom and walls erected from the bottom surface to form a box-like enclosure, and on which mechanically functioning components are attached, and a fastening section provided at the periphery of the mechanical component attachment section for fastening the controller board and power unit, is formed by integral molding from a plastic material. Suitable plastic materials are ABS resin, PPO resin, PC/ABS polymer alloy resin, or ABS/PBT polymer alloy resin that is reinforced with glass fiber.

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PRINTER

FIELD OF THE INVENTION

This invention relates to a printer, and particularly to a frame structure, including a case, for a printer.

BACKGROUND OF THE INVENTION

Figure 5 is an exploded perspective drawing showing an example of the configuration of a frame, including a case, of a typical serial printer in the prior art.

In the figure, a printer cover 1 is formed by plastic molding or aluminum diecasting, and its upper surface forms an open, shallow box. A ground plate 2 is placed so as to cover the bottom surface of lower cover 1. In addition to acting as an electrical ground, ground plate 2 is used to increase the rigidity of lower cover 1.

Mounted on a controller board 3 are circuit components or electrical parts for controlling the operation of the printer. The controller board 3 is superimposed over ground plate 2 and attached by several screws.

A power unit (mainly composed of transformer) 4 is also attached to ground plate 2 by means of screws or the like. Electrical cord 5 connects the unit to an external power supply.

A mechanical unit 6 comprises the mechanically functioning components performing actual printing operation. It has a mechanism frame 7, formed by plastic molding or sheet metal processing, to support the overall structure. A cylindrical platen 8 is installed, with its both ends being supported by the both sides of the mechanism frame 7, so as to be rotatable. Also provided are a print head 9 having its tip placed in opposition to the platen 8, a carriage 10 on which the print head 9 is mounted and which is capable of spacing movement along the axial direction of platen 8, and a carriage shaft 11 which supports carriage 10, as well as various levers, rollers, guides, and the like.

A plurality of connectors 12 connect respective components of mechanical unit 6. By connection to the connectors of controller board 3 mounted on lower cover 1, connectors 12 establish an electrical connection to the components of the mechanical unit 6, i.e., the driver for the platen 8, the print head 9, and the carriage 10.

An upper cover 13 is formed, as is lower cover 1, into a box-shape, opening downward, by plastic molding or aluminum diecasting. It is attached so as to cover lower cover 1, and mechanical unit 6 which is attached to the lower cover 1.

A platen knob 14 is attached to a platen shaft (not shown), which supports platen 8 of mechanical unit 6 through upper cover 13. By turning platen knob 14, one can rotate platen 8.

The upper cover 13 is provided with a medium ejection outlet 15 at the rear-top of the upper cover 13. Print media on which printing has been made are ejected through this ejection outlet 15. The upper cover 13 also has a sheet guide 16, which guides the print media after they have been ejected from medium ejection outlet 15.

To assemble the printer of the above configuration, first, controller board 3 and power unit 4 are attached and fastened, by a fastening means such as screws, to the specified attachment locations of ground plate 2, which has been attached to the inner bottom surface of lower cover 1.

Next, mechanical unit 6 including a mechanical frame 7 in which are mounted platen 8, and carriage 10 on which print head 9 is mounted is placed so as to overlie cover 1 and is also fastened by screws. At this time the connectors are plugged into corresponding connectors ; thus the electrical connections of mechanical unit 6 are obtained.

Finally, upper cover 13 is connected from the top so as to cover both mechanical frame 7 and lower cover 1 and is fastened by screws in several locations. Assembly of the printer is thus complete.

Figure 6 is an exploded perspective view showing another prior-art example of which the mechanical unit 6 is a little simplified. A difference from the previous example is that a paper chute, which guides to the platen the print medium on which printing is to be performed, and the lower cover are formed by integral molding.

Note that in this figure the upper cover is omitted.

In Figure 6, a lower cover 17 is formed by plastic molding or aluminum diecasting. The lower cover is formed by integral molding together with the paper chute 18, which guides a print medium on which printing is to be performed, toward platen 8 of the mechanical unit. This eliminates the need to provide the mechanical unit with a paper chute, thereby making the structure simpler, smaller, and lighter.

As with the example of Figure 5, a controller board 3 for controlling and driving printing operation, and a power unit 4 are attached to lower cover 17 by a fastening means such as screws. In addition, fastened to the bottom of lower cover 17, with screws as before, is a ground plate 2 to enhance the rigidity of lower cover 17 and to maintain an electrical ground potential.

A mechanical unit 19 has lateral side frames 19a and 19b which support platen 8, carriage shaft 11 which supports carriage 10 in such a way that carriage 10 is capable of spacing movement, with print head 9 being mounted on carriage 10, support shaft 20 which also supports carriage 10, and the like.

To assemble the printer of the above configuration, first, ground plate 2 is attached and fastened, by screws, to the bottom of lower cover 17. After that, controller board 3 and power unit 4 are fastened, with screws, in the respective locations behind paper chute 18, on lower cover 17 formed by integral molding.

Next, mechanical unit 19 is attached by overlaying it from above in such a way that platen 8 of mechanical unit 19 conforms to paper chute 18 of lower cover 17. This too is fastened in several locations with screws.

Finally, an upper cover (not shown) is connected so as to cover lower cover 17 and mechanical unit 19. This completes the assembly of the printer.

However, the above described prior-art structures have the following problems.

First, in the example of Figure 5, the configuration is such that controller board 3, power unit 4, and mechanical unit 6 are laid over lower cover 1 ; thereby, lower cover 1 and mechanical frame 7 form a double structure, and mechanical strength increases ; however, in addition to an increase in complexity through an increased number of parts, assembly was time consuming since controller board 3 and power unit 4 must be attached to lower cover 1 and ground plate 2, respectively, by screws.

Furthermore, electrical connections as well of controller board 3 and mechanical unit 6 must be made by connecting connectors 12 one by one ; this also was a factor in decreasing the efficiency of assembly.

In the other example shown in Figure 6, mechanical unit 19 supports platen 8, carriage shaft 11, and support shaft only by lateral side frames 19a and 19b; therefore, rigidity against bending and twisting was insufficient, and print head gap is inconsistent. A large ground plate was sometimes used for reinforcement, but this was disadvantageous.

SUMARY OF THE INVENTION

The invention has been conceived to solve these problems and its object is to provide a printer that is easy to assemble and has a high mechanical strength, while the number of parts is reduced and its structure is simplified.

In order to fulfill the above purpose, the invention is featured by the fact that the lower cover and mechanical unit shown for the prior art are formed by integral molding, i.e., in a single unit. That is, the invention is a printer which comprises a mechanical unit having a platen, a carriage on which a print head is mounted, and other mechanical components, and a controller board and a power unit connected via connectors to the respective mechanical components of the mechanical unit, and an upper cover covering these from above, wherein a main frame comprising a mechanical component attachment section which has a horizontal bottom surface and side surfaces erected from the bottom surface to form a box-like enclosure, and on which mechanical components are attached, and a fastening section provided at the periphery of this mechanical component attachment section and fastening the controller board and power unit, is formed by integral injection molding, from ABS (acrylonitrile-butadiene-styrene copolymer) resin reinforced with glass fiber, PPO (poly(phenylene oxide)) resin reinforced with glass fiber, PC/ABS (polycarbonate/ABS) polymer alloy (polymer blend) resin reinforced with glass fiber, or ABS/PBT (ABS-/polybutylene terephtalate) polymer alloy resin reinforced with glass fiber.

With the above configuration, part of the main frame serves as the mechanical unit by attaching, to support sections formed in the side walls of the main frame, the platen, the carriage on which the print head is mounted, the carriage shaft which supports the carriage, and the like.

Furthermore, fastening sections, which attach and fasten the controller board and power unit, are formed around this mechanical section ; thereby making it possible to attach the controller board and power unit to the fastening sections without screws.

A main unit is configured by attaching mechanical components, the controller board, and the power unit to a single main frame in this manner ; attaching an upper cover so that it covers this main unit completes assembly of the printer.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is an exploded perspective drawing of a printer showing an embodiment of the invention.

Figure 2 is an magnified perspective drawing showing the structure of the main frame shown in Figure 1.

Figure 3 is a perspective drawing of the pertinent portion of the main frame showing the attachment structure of the power unit.

Figure 4 is a perspective drawing of the pertinent portion of the main frame showing the attachment structure of the controller board.

Figure 5 is an exploded perspective drawing showing a prior-art structure.

Figure 6 is an exploded perspective drawing showing another prior-art structure.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

An embodiment of the invention will now be explained below in reference to diagrams.

Figure 1 is an exploded perspective drawing of a printer showing an embodiment of the invention. Figure 2 is an enlarged perspective drawing showing the structure of the main frame shown in Figure 1. Figure

3 is a perspective view showing the pertinent portion of the main frame showing the structure for attachment of the power unit, and Figure 4 is a perspective view of the pertinent portion of the main frame showing the structure for attachment of the controller board. In these diagrams, parts that are identical or similar to those of the prior art are given the same symbols ; and their explanations are omitted.

In Figure 1 through Figure 4, a main unit 21 has a main frame 22 comprising a mechanical component attachment section 22b and a fastening section 22c which are formed by integral molding. Attached to the mechanical component attachment section 22b and supported by it are mechanically functioning parts or components, such as platen 8, carriage 10 on which print head 9 is mounted, and the like. Fastened to the fastening section 22c are controller board 3 and power unit 4.

Main frame 22 is molded to the structure shown in Figure 2 from a plastic, such as ABS resin reinforced with glass fiber, PPO resin reinforced with glass fiber, PC/ABS polymer alloy (polymer blend) resin reinforced with glass fiber, ABS/PBT polymer alloy resin reinforced with glass fiber, or the like.

Front wall 23a, side walls 23b and 23c, and back wall 23d are erected to enclose a box-shaped space to dispose various mechanical components. Furthermore, attachment structures are formed on these walls on the inside and outside of the enclosure for installing these components.

A platen support section 24 is formed on opposite surfaces of the side walls 23b and 23c and supports platen 8 (shown in Figure 1) so that the platen 8 may rotate. A pin tractor support section 25 supports a pin tractor (not shown) for feeding a print medium (not shown). A paper guide section 26 guides the print medium to platen 8. A carriage support section 27 is provided for supporting carriage shaft 11, which guides carriage 10.

In this way, support sections for supporting mechanical components are all provided on main frame 22.

Furthermore, 28 is a catch provided to attach power unit 4 (shown in Figure 1). This catch is formed by integral molding with lower cover 17 and serves as a structure to which power unit 4 can be attached without the use of screws. Likewise, a hold-down 29 is formed by integral molding to hold down an end of power unit 4 and keep the power unit 4 attached to lower cover 17.

Details of the structure for attachment of power unit 4 is shown in Figure 3. As can be seen in the figure, a projection 4a is provided on one end of the bottom base of power unit 4 and a flexible hook 4b is provided on the other end as means for attachment corresponding to catch 28 and hold-down 29 which are formed on main frame 22.

Catch 28 is positioned in opposition to and in correspondence with projection 4a of power unit 4. When attaching power unit 4, first, projection 4a of power unit 4 is inserted into groove 28a of catch 28 ; after they are engaged, power unit 4 is lowered down, whereupon hook 4b of the other end will contact hold-down 29. If pressure is applied downward so as to push it down, hook 4b will bend back and slip into hold-down 29.

Thus, by supporting one end of power unit 4 with catch 28 and the other end with hold-down 29, it is possible to attach power unit 4 to the specified position of main frame 22 without the use of separate parts such as screws.

To remove power unit 4, a tool, such as a screwdriver, is inserted into a hole formed on the bottom surface as shown in Figure 3, hook 4b is pushed inward (in the direction of the arrow in the figure) to release the restraining force acting on hold-down 29. By this, power unit 4 can be removed from main frame 22.

Returning to Figure 2, a support projection 30 is used for attaching a power unit board provided adjacent to the attachment position of power unit 4. The structure for attachment of the power unit board, including this support section 30, is shown in Figure 1 and Figure 4.

In Figure 1 and Figure 4, provided on the top surface of a power unit board 31 are a connector 12 for connection with power unit 4 and another connector 12 for connection with controller board 3.

A snap 32 cooperates with support projection 30 (shown in Figure 2) to form an attachment structure for power unit board 31. Snap 32 is positioned in opposition to support projection 30 and has a flexible structure.

To connect power unit board 31 with these, one end of power unit board 31 is pushed into support projection 30 to achieve engagement, and then, in this condition, the other end is lowered and is pushed down against snap 32, formed in correspondence to that other end, so that snap 32 bends back ; whereupon, by snap 32 and support projection 30, power unit board 31 will become attached to main frame 22.

To remove power unit board 31, snap 32 is bent back toward the outside of power unit board 31 (in the direction of the arrow in the figure) to release the locking action with power unit board 31. Power unit board 31 is thereby removed from main frame 22.

As described above no screws are used to attach power unit board 31.

Returning to Figure 1 and Figure 2, on main frame 22 are also formed attachment structures for attaching controller board 3.

Formed on one side (the left end as seen in the figures) of main frame 22 are seats 33a and 33b for attaching controller board 3. Formed on the bottom surface of the main frame 22 is a mating hole 22a that mates with mating tab 3a, which protrudes downward from the bottom of controller board 3.

A lock plate 34 (shown in Figure 1) functions in cooperation with seat 33a, which is one of the two seats 33a and 33b. An attachment post 35 engages with the other seat 33b.

Attachment of controller board 3 is done first by inserting mating tab 3a, which is on the bottom of controller board 3, into mating hole 22a of main frame 22; thereby mating the two. Afterwards, the upper end of controller board 3 is supported to seat 33a with lock plate 34 ; and, attachment post 35 is inserted in the other seat 33b through a hole in the controller board 3 and fastened, and the controller board 3 is thereby attached to main frame 22.

Mechanical components of the printer, i.e., platen 8, print head 9, carriage 10, carriage shaft 11, platen drive motor, levers, and the like, are attached and assembled as shown in Figure 1 at their respective support sections inside and outside the enclosure formed by front wall 23a, side walls 23b and 23c, and back wall 23d of main frame 22 shown in Figure 2.

When these parts have been attached, main unit 21 is completed. Covering main unit 21 with an upper cover 13 and finally attaching a platen knob 14 on the other end of upper cover 13 completes assembly of the printer.

As has been described, according to the invention, a main frame having a mechanical component mounting section which has a horizontal bottom surface and wall surfaced erected from the bottom surface to form a box-like enclosure, and in which mechanical components are attached, and a fastening section at the periphery of this mechanical component attachment section for fastening a controller board and power unit, is integrally molded from ABS resin reinforced with glass fiber, PPO resin reinforced with glass fiber, PC/ABS polymer alloy resin reinforced with glass fiber, or ABS/PBT polymer alloy resin reinforced with glass fiber. Assembly of a printer is completed by attaching the mechanical components, the controller board and the power unit board at the respective positions of a single main frame, and attaching an upper cover over the main unit.

Assembly of the printer is therefore very easy. The controller board and the power unit board are attached by means of the structures formed by molding, and without resorting to screws, so efficiency in the assembly is further improved.

In addition, since the main frame is formed out of a strong plastic, there is no need for a large ground plate to assure rigidity. Moreover, since the mechanical component attachment section comprises walls erected to form a box-like structure, the mechanical strength is high, and bending and twisting are prevented, and the print head gap is stabilized.

Claims

1. A printer comprising :

   a mechanical unit having a platen, a carriage on which a print head is mounted, and other mechanical components ;

   a controller board and a power unit connected via connectors to the respective mechanical components of the mechanical unit ; and

   an upper cover covering these from above ; wherein

   a main frame comprising a mechanical component attachment section which has a horizontal bottom and walls erected from the bottom surface to form a box-like enclosure, and on which mechanically functioning components are attached, and a fastening section provided at the periphery of the mechanical component attachment section for fastening the controller board and power unit, is formed by integral molding from a plastic material.

2. The printer of claim 1, wherein said main frame is formed, by injection molding, from ABS resin reinforced with glass fiber, PPO resin reinforced with glass fiber, PC/ABS polymer alloy resin reinforced with glass fiber, or ABS/PBT polymer alloy resin reinforced with glass fiber.

3. The printer of claim 1, wherein

   said mechanically functioning components include a platen, and a carriage on which a print head is mounted.

4. The printer of claim 1, wherein the mechanically functioning components are attached to the walls of said mechanical component attachment section.

5. The printer of claim 1, wherein said walls of the mechanical component attachment section comprises a front wall, a rear wall, and a pair of side walls, and said power unit is disposed adjacent said rear wall, and said controller board is disposed adjacent one of the side walls.

6. A printer comprising :

   a mechanical unit (21) including a platen, and a

   carriage on which a print head is mounted;

   a controller board (3) and a power unit (4) for driving the mechanical unit (6) ; and

   a cover (13) covering said board and units,

   characterised by

   a main frame (22) comprising a mechanical component attachment section (22b) for components of the mechanical unit, and a fastening section (22c) provided at the periphery of the mechanical component attachment section for receiving the controller board and power unit, the main fram being formed by integral molding of a plastics material.

F I G. 1

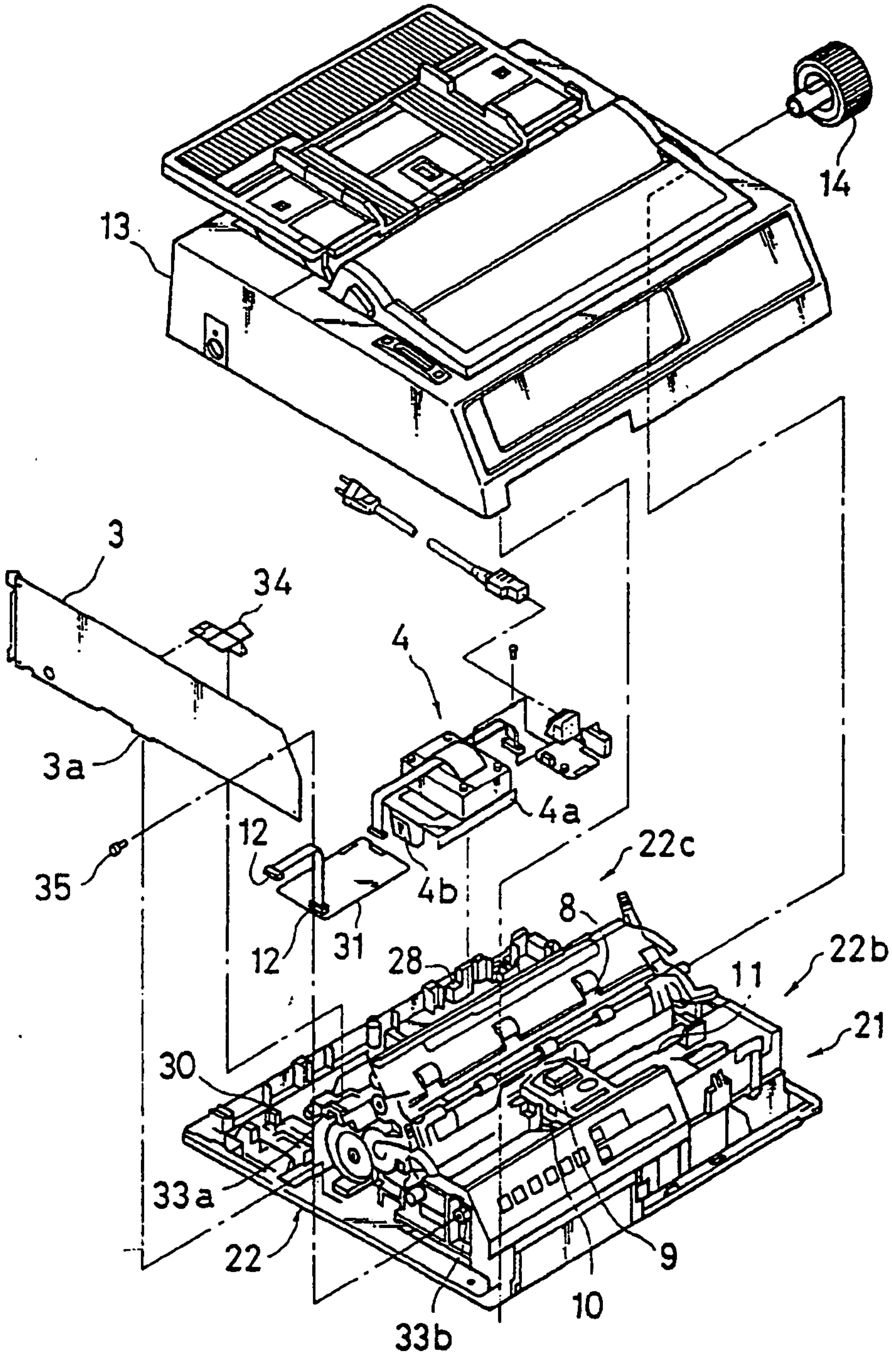
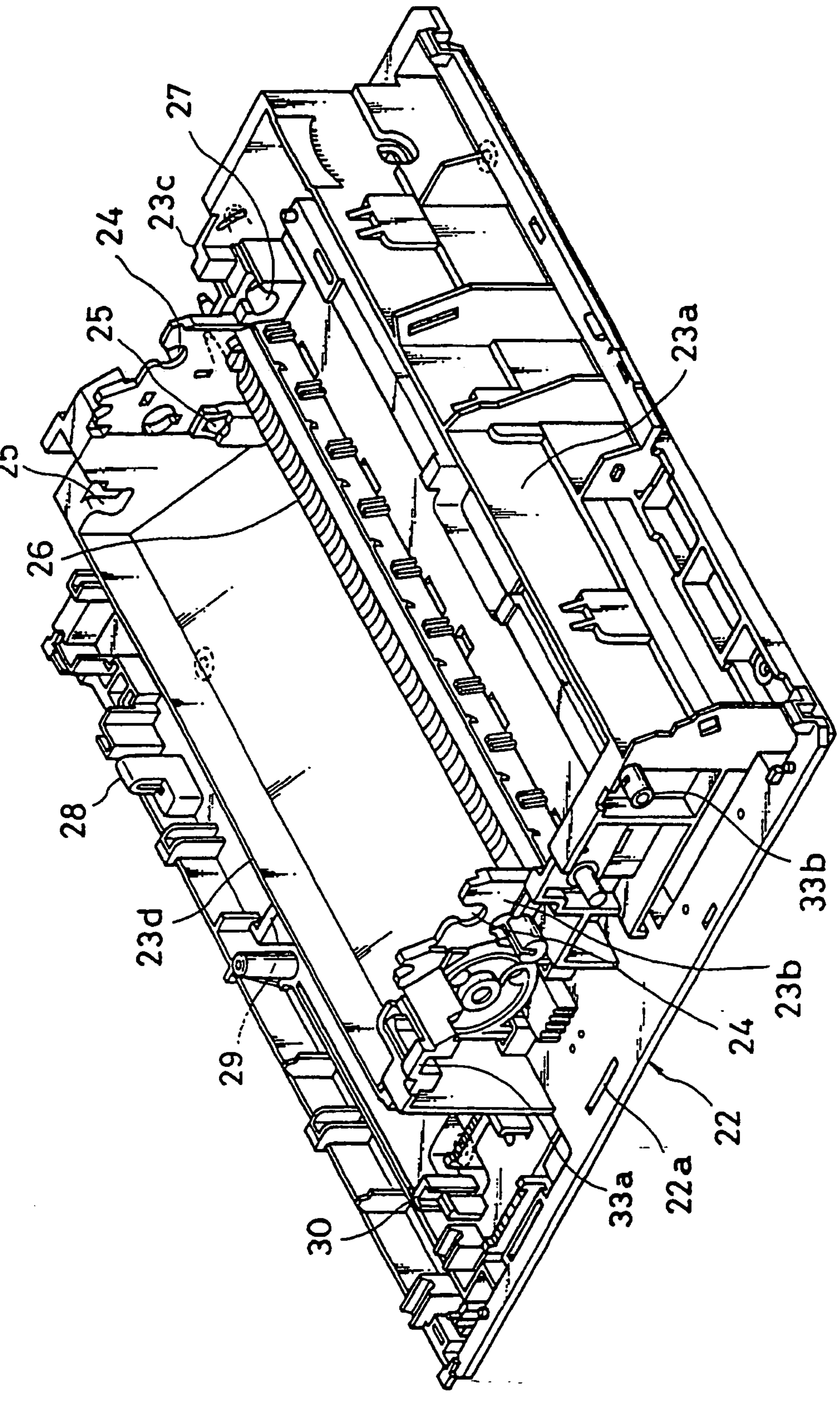
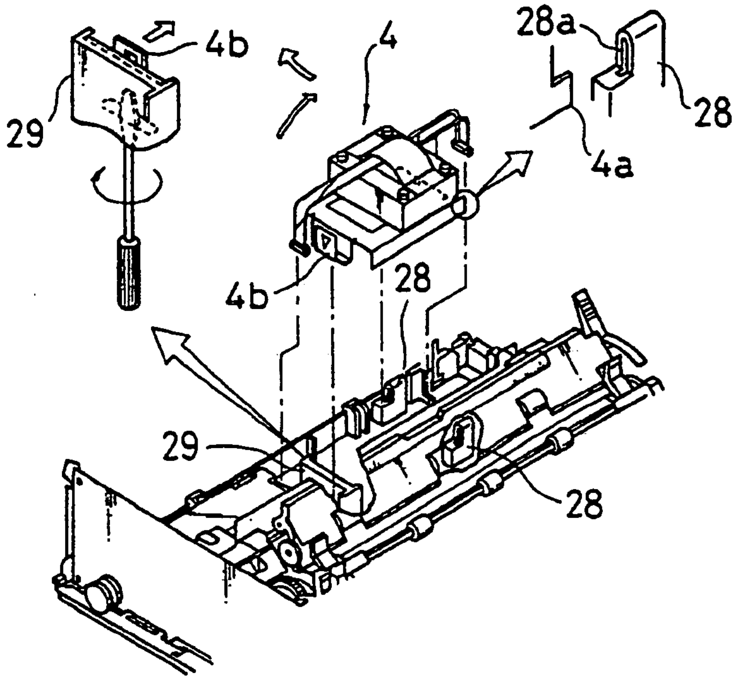


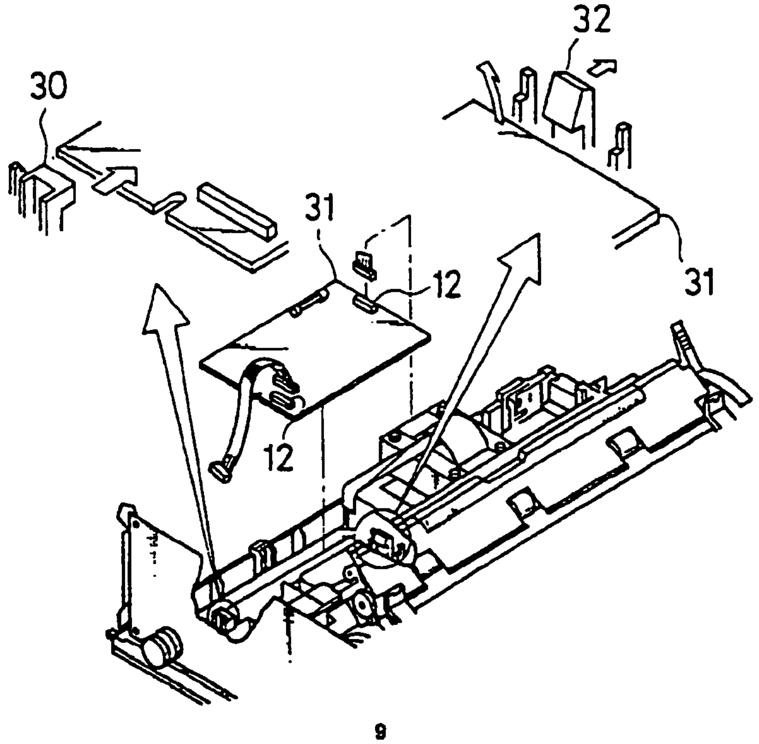
FIG. 2



F I G. 3



F I G. 4



F I G. 5

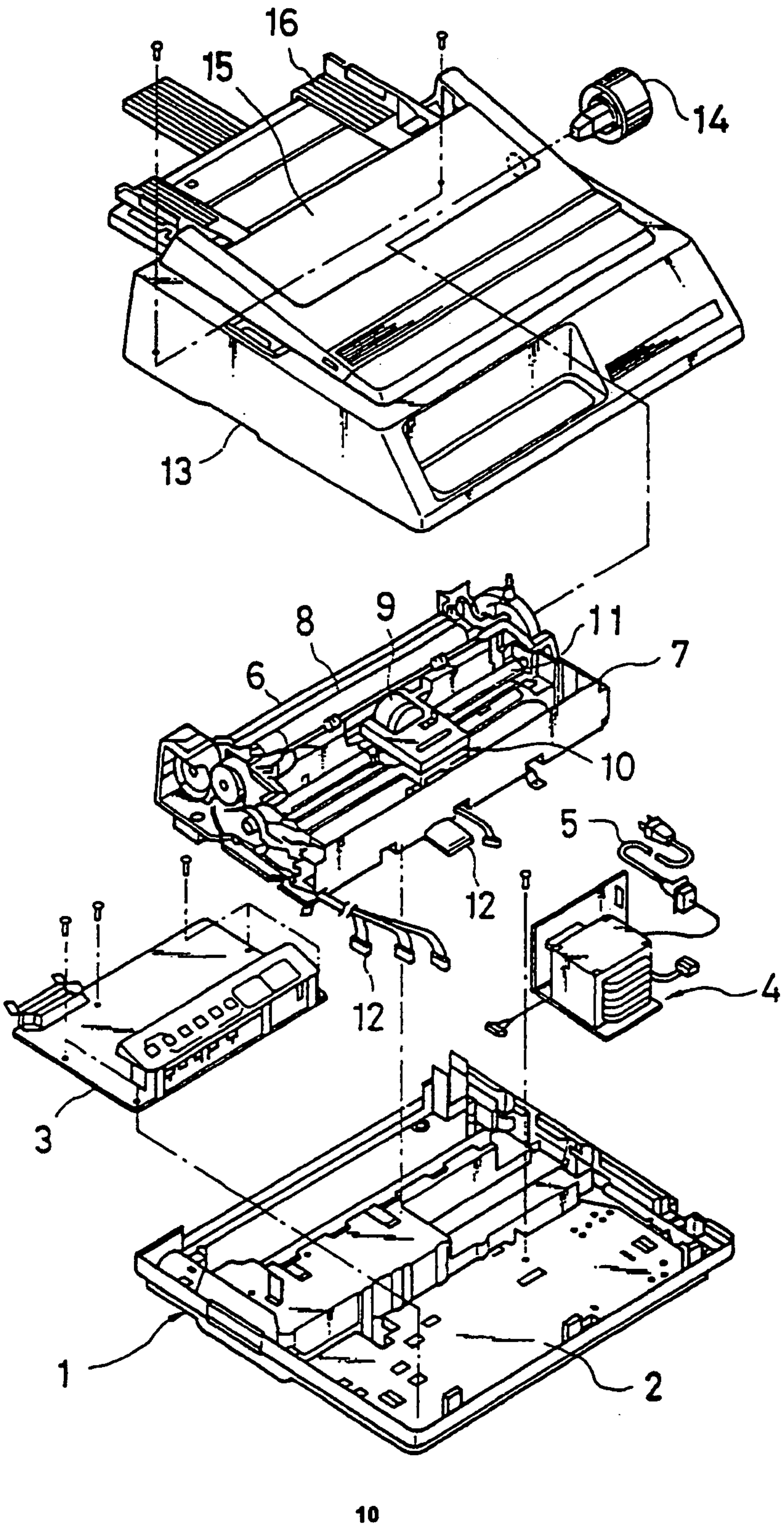


FIG. 6